

0622-00-15
1936 H
THE WIREWORM PROBLEM IN FIELD CROPS OF WESTERN CANADA: A SUMMARY

Kenneth M. King and Robert Glen

Fourteen years' investigations show that fully three-fourths of the farms over wide areas of Western Canada have a "permanent" wireworm problem of considerable, often great, importance. Yet not one farmer in ten realizes the cause of this loss, even though it often averages fifteen to twenty percent annually of the crop on individual farms, and over the Prairie Provinces as a whole costs farmers millions of dollars each year. The common failure to correctly diagnose the trouble arises because damage by wireworms is usually in the nature of a general crop thinning, similar to that which may result from a variety of other causes; and because the habits of this soil-dwelling insect make them difficult to find, in any numbers, except during a limited period each season.

Wireworms are hardy native insects, which in general have been steadily increasing since the breaking of the native sod, because the common tillage methods and cropping practices have favoured their survival. A new high level of abundance has now resulted from conditions accompanying the period of drouth and depression, and fields left idle, or in which weeds have been poorly controlled, for a few seasons, should be particularly watched.

Wireworms live five to ten years and rarely move more than a few yards. Consequently, unless definite measures are taken to reduce it, the problem usually persists more or less permanently, once a serious infestation has become established.

For all of these reasons, the control of wireworms is a vital factor, both to our immediate recovery and to the establishment of a permanently productive system of western agriculture. Fortunately, effective control is feasible without added cost or time, and can be achieved by individual effort, -- not depending upon organized community action.

HAVE YOU A WIREWORM PROBLEM?

Where Prevalent. Fields of medium, light or moderately-heavy soils, in districts of prairie or open parkland, are most subject to severe and widespread infestations of a permanent character. The pest is, however, of at least moderate importance in every part of Western-Canada that has been carefully surveyed.

Under our conditions the most troublesome infestations have been found, as a rule, in fields that have long been used for grain growing; and especially where there has been serious neglect of weeds for a few seasons, with perhaps excessively deep ploughing on some occasion. Unlike the type of wireworm common in many other areas, serious infestations of prairie wireworms do not depend upon the use of grass in the rotation; nevertheless the pest here does increase where land has been in sod for some time, and in very heavy clay soils the worst, and often the only serious, infestations are encountered under such conditions. In willow-scrub land there is usually a wireworm problem for only a few years after breaking, but later a more permanent type of infestation may build up.

Field Symptoms. The broad symptoms of damage by wireworms are entirely characteristic, if taken in combination and over a period of years:-- a thin poor stand; or a general condition of patchiness, which is worse on knolls, in spots of infertile soil, and in places that have been weedy for some years. In more severe cases, nearly the whole crop may be eaten out, but characteristically with plants still growing in the drill-wheel tracks, on headlands, and in other spots of heavily packed soil. Be particularly suspicious of wireworms if the injury is more common and more severe to the crop on summerfallow than to that seeded on stubble; if the loss is most pronounced in warm dry springs; or if the damage tends to recur in the same fields -- especially if in the same spots -- every year that conditions are favourable to the pest.

Some of these symptoms, taken separately, may result from other causes, particularly cutworms or other insects, rootrots, "burnout" spots of very infertile soil,

or the use of poor seed or defective drills. In addition to the harm which they cause directly, these factors also increase the ravages of those wireworms present.

Damage Symptoms of Seed and Plants. Planted kernels may be entirely eaten out, leaving only the empty seed-coat; but more frequently, especially in dry soil, only the sprouted germ is destroyed before another seed is attacked. The young plant is injured by the wireworm boring into the underground part of the stem, where it feeds mainly on the centre tissues, often giving a "shredded" appearance to the injured part, but rarely completely severing the stem. Young seedlings usually die almost at once, but with somewhat older seedlings it is very typical to find the central shoot dead while the outer leaves remain green for some time.

In sharp contrast:- Cutworms completely sever the young stems, usually at or near the soil surface, frequently eating the tops partially or completely, especially in wet weather. With rootrots the outer leaves of the plant die first, while below the ground there is usually discoloration and perhaps shrivelling of the stem.

The Wireworm Itself. Wireworms are most easily found if the search is made at the time, and place, that young grain plants are observed in a dying condition. This will be in May or early June, at which time they are gathered in the top three or four inches of soil and along the drill rows. If the search is made later the pest will probably not be found because it burrows deeply into the soil during the hotter, drier weather. Wireworms are shiny, yellow, hard-bodied worms, rather sluggish in their movements; full-grown specimens are almost an inch in length, but usually various sizes are found together in the same field.

In contrast:- Cutworms are soft-bodied and grayish, almost as thick as a lead pencil when full-grown, and curl up when disturbed. It is essential to distinguish between cutworms and wireworms because of important differences in habits and means of control.

Send Specimens of the wireworms found in your field, even if you are familiar with the pest. This will be of material assistance to the investigations which still need to be carried on. A number of living wireworms (preferably from different parts of the farm or field) should be sent in a tight container, in moist soil and with a few grains of wheat or a piece of potato for food.

OUTLINE OF CONTROL MEASURES

There are two primary aspects of the procedure to control wireworms:-

- (A) Proper methods of preparing the seed bed and of seeding, to lessen crop thinning.
- (B) Proper tillage, especially of the summerfallow, not only to gradually reduce the more serious infestations, but also to hold wireworms in check in fields where they are not yet abundant.

These objectives are to be secured, not by any single measure, but by combining as many as possible of the practices which have been proved to contribute materially towards the desired end, and particularly by eliminating those practices which have been found harmful relative to wireworm control.

It is particularly significant that the essential recommendations not only fit into a sound general agricultural program, but also definitely contribute towards the solution of other important problems which confront the farmer.

To reduce wireworm numbers THE MOST ESSENTIAL THING IS ALWAYS TO KEEP THE SUMMERFALLOW CLEAN FROM THE MIDDLE OF JUNE TO THE END OF JULY, when the newly-hatched wireworms are first seeking food; THE COMPLETE DESTRUCTION OF ALL LARGE WEEDS MUST BE ENSURED, and if some of these have been missed by the implement it is often practical economy to remove them by hand.

PLOUGHING OR OTHER TILLAGE SHOULD NOT BE DEEPER NOR MORE FREQUENT THAN NECESSARY. Weed control operations should be so planned as to give a cultivation, to a depth of three or four inches, during the last week of July (a few days earlier in northern sections), in order to destroy many of the fragile pupae of this pest then present in the top soil.

Summerfallowing at least every third season seems necessary for this purpose, and there are indications that more rapid results are possible by summerfallowing every second year.

Provided these objectives are accomplished, all methods of clean summerfallowing seem almost equally effective for the gradual reduction of wireworm numbers. Thus each farmer may choose the procedure which he has found by experience to be the best suited to his local conditions and the implements available. The ploughless fallow, when properly performed, gives the added advantage of helping to secure a firm seed bed.

To reduce wireworm damage:- The extent to which the wireworms present in a field will injure grain crops is highly variable; it depends in part on current weather conditions, but even more upon farm practices. THE DEGREE OF CROP THINNING CAN BE GREATLY REDUCED BY A COMBINATION OF SUITABLE TILLAGE AND SEEDING METHODS WHICH ENCOURAGES THE RAPID VIGOROUS DEVELOPMENT OF THE YOUNG CROP AND RETARDS THE MORE HARMFUL ACTIVITIES OF THE PEST.

The main points are:-

1. Have the seedbed as firm as practicable, but ensure that it is free of weeds; the firmness depends in considerable measure on the depth of previous tillage, particularly during the fallow year.
2. Offset some of the destruction by wireworms, by seeding at a somewhat heavier rate than usual, and by using seed capable of full germination and vigorous growth; cross-drill patches known to be heavily infested.
3. Seed 2 1/2 to 3 inches deep; avoid too deep seeding.
4. Seed wireworm infested fields, particularly summerfallow, just as soon as there are GOOD seeding conditions; if the soil is very dry, it is advisable to wait until sufficient rain falls to ensure immediate germination.
5. There are marked advantages in using the press-drill or standard drill with press attachment, because the soil is firmed along the drill rows; seeding implements, such as the seeder attachment to the one-way disc, which leave the soil excessively loose around and above the seed, or place it at irregular depths, are very undesirable in infested fields.
6. Use new-improved ceresan or copper carbonate as the smut treatment for grain to be seeded; this is especially important for wheat. (Formalin not recommended, see page 4).
7. Where the slight extra cost can be met, the use of phosphate fertilizer, in accordance with the recommendations for the local area, gives markedly larger yields in infested fields, especially of wheat on fallow. Other fertilizers, such as barnyard manure, nitrogen, clovers etc., are of advantage under certain conditions, such as in the gray soils of wooded areas.

When it has not been possible fully to carry out the recommended procedure, and the soil therefore is excessively loose around the seed, thorough cross-packing, if done immediately after the drill, may give sufficient advantage to justify its use. In general, packing the entire soil surface (as contrasted to packing the drill-rows only) is not recommended because it involves added cost and undesirable delay in seeding, and often means increased hazard of soil drifting.

While these recommendations apply particularly to fields known to be infested by wireworms, with special attention to protecting the wheat crop seeded on fallow, they are based on sound agricultural practices and hence may be safely and profitably employed wherever there is any suspicion of trouble from this pest.

Relation to Different Crops. Irrespective of the type of grain to be grown on a wireworm-infested field, the recommended measures for reducing the damage should be followed as closely as possible. Nevertheless the choice of crop is of considerable importance, and where infestations are very severe it is advisable to seed crops which are more resistant to attack by this pest and to continue the use of such crops until the infestation has been considerably reduced by the fallow method recommended above.

Although wheat and spring rye are the most susceptible of the small grains to damage by wireworms, a large degree of protection is ordinarily afforded if the recommended precautions are taken. But if the pest is exceedingly abundant serious damage will result to these crops even when the entire recommended procedure is carried out.

Oats are the most wireworm-resistant of our small grains and hence are fairly successful even on severely infested land. Under such conditions, however, it is highly important that oats be seeded early, and not left until after the wheat crop is planted.

Barley is also better than wheat because the surviving plants stool quickly and profusely to offset much of the general thinning.

Flax seems valuable on breaking, but otherwise often suffers severely from wireworms. Fall rye escapes much of the damage because of its early growth in the spring, but sometimes is thinned considerably from attack in the autumn. Sweet clover, alfalfa, and grasses usually escape serious injury under field conditions.

Corn, potatoes and sunflowers are so severely injured that they should never be used in infested fields.

Re-seeding. Where a first seeding has been ruined by wireworms, immediate re-seeding with small grains or flax is usually quite safe. (Note important contrast with cutworms).

PRACTICES NOT RECOMMENDED

Because they tend to maintain or increase wireworm numbers, wherever this pest is of importance:-

Avoid leaving summerfallows weedy during July.

Avoid unnecessarily deep or frequent ploughing or other tillage.

Because they increase the degree of crop injury, in fields known to be infested:-

Avoid formalin treatment especially of wheat seed, because it tends towards a weak slow growth of seedlings which make the crop much more subject to injury by wireworms.

Avoid poor weak seed, such as badly frosted grain.

Avoid seeding implements (or tillage practices) which leave the soil excessively loose around the seed.

Avoid excessively deep seeding.

Avoid seeding into very dry hot soil.

Avoid crops which, in spite of every precaution, are likely to suffer excessively from the infestation present in a field.

Repeated trials have proved that certain measures are useless:-
Poisons applied to the seed, and poisoned baits, have been completely ineffective against wireworms, evidently because they do not eat the poison. (Note difference from red-backed cutworm and grasshoppers).

"Repellents" applied to the seed are either ineffective against the pest or harmful to the seed; and in any event could not be expected to protect the seedling against which the most serious wireworm attack is directed.

Soil fumigants, and "trapping" wireworms, while sometimes worthwhile under garden and truck-crop conditions, are far too costly for use with field crops.

FURTHER INFORMATION RE WIREWORMS

Detailed leaflets, and aid with individual problems, are freely available on request:-

Saskatoon Leaflet No. 35 deals with control in field crops, giving a full explanation of the recommendations.

Saskatoon Leaflet No. 44 covers the distinct problem of wireworm control in gardens and potato fields.

Address inquiries concerning wireworms, and send wireworm specimens, to:-

Dominion Entomological Laboratory,
Saskatoon, Sask.